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Letter to the Editor

Intraosseous devices in small children: The need for a clearly defined strategy

Dear Editor,

We read with great interest the recently published study by Maxien et al. on the rate of malposition of intraosseous (IO) needles in pediatric cadavers.[1] The study showed a high malposition rate, up to 64%, especially in infants of less than one-year-old. These results are well analyzed by the authors. However, we believe that this high malposition rate raises a strategy issue rather than an age, weight or training issue. Perhaps a more suitable question would be: which strategy adopt based on the type of IO device used, the age of the child and the location of the IO site?

Three classical IO devices are utilized in infants: The Cook Intraosseous Infusion Needle (Cook Critical Care, Bloomington, IN), the Jamshidi Intraosseous Needle (Baxter Healthcare, Deerfield, IL) and the EZ-IO device with a motor-driven drilling system (Vidacare, San-antonio, TX, USA). Each needle has specific characteristics. For all three devices, the tip of the needle without the stylet, measures less than 4 mm. However, for the EZ-IO device, the tip of the needle with the stylet grows up to 5–6 mm compared to 2 mm for the other two needles (Fig. 1). The small diameter of the bone marrow space as well as the length difference between the three devices makes it an arduous task to correctly place an IO device in small children. Indeed, the diameter of the medullary cavity of the proximal tibia is estimated to 7 mm ± 3 mm for infants <1 year, to 4 mm for newborn and only 2 mm in 20–41 weeks of gestation neonate.[1–4] The correct placement of the EZ-IO needle is therefore a challenging task in the proximal tibial site for small children. The risks are mainly that the needle penetrates the opposite cortex or protrudes outside the cortex. Manual IO devices do not encounter this difficulty because of their smaller tip of needle length.

Other IO placement sites have frequently been described such as the distal tibial or distal femur IO site.[5] However, there is a lack of information about the antero-posterior diameter of the femoral medullary space. Also, the medio-lateral diameter of the distal tibial medullary space is not well known. Another issue is the diameter of the corticalis because it conditions the stability of the needle. We need large evaluations of these parameters in order to determine which site has the larger medullary cavity.

Extravasation causing compartment syndrome is a classic complication of the tibial site. Femur site is not concerned by compartment syndrome but extravasation recognition may be retarded due to the enlarged diameter of the thigh. Whatever the site, extravasation is always problematic when inotropic drugs or

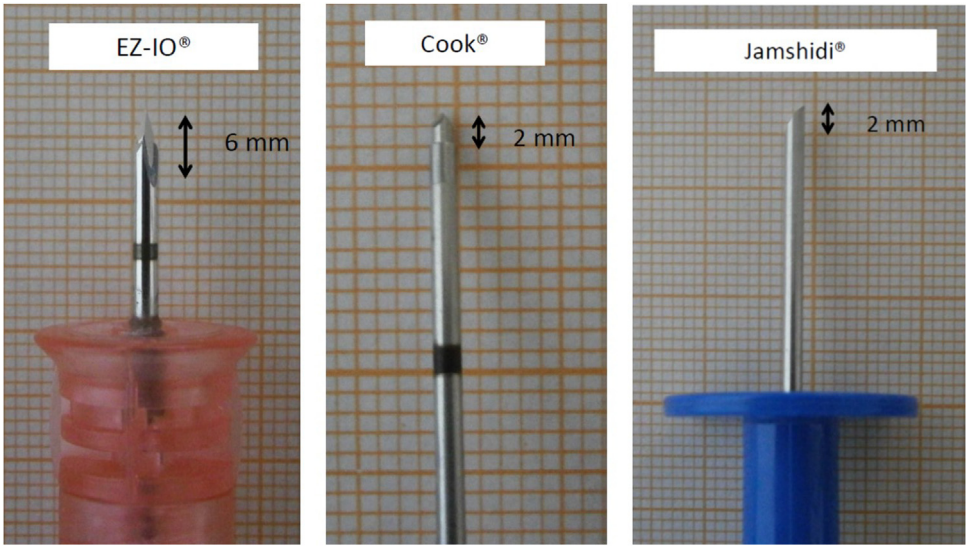

Fig. 1 – Comparison of the tip of the needle of 3 IO devices.

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hypertonic solutions are used. The femoral site should probably be limited to fluid expansion or resuscitation of cardiac arrests. Correct position should be checked regularly in order to detect early extravasation especially in case of inotropic infusions.[4]

IO access remains challenging in neonates and infants in regard of their age and different existing IO devices. We need anatomical studies to precise which site offers the largest intramedullary cavity. In addition, we should develop strategies to determine the best IO site according to the type of drugs we need to infuse in order to limit potentially serious extravasation complications. The modalities of IO uses in the pediatric population still remain to be written.

Conflicts of interest

None of the author of this manuscript have any conflicts of interest.

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